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(54) Title: HIGH HOMOGENEITY SILICA GLASS PREPARED THROUGH A SOL-GEL PROCEDURE

(57) Abstract: The present invention relates to a Si₂O glass characterized by a high homogeneity, prepared through a sol-gel pro-
cedure.

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HIGH HOMOGENEITY SILICA GLASS PREPARED THROUGH A SOL-GEL PROCEDURE

5 The present invention relates to a highly homogeneous Si₂O glass prepared through a sol-gel procedure.

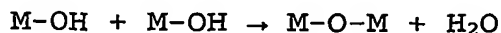
The sol-gel term defines a wide variety of processes which, even if being different as for as the working details or the reagents are concerned, are characterized by the following common operations:

- 10 - preparation of a solution, or a suspension, of a precursor formed by a compound of the element (M) the oxide of which has to constitute the final glassy article;
- 15 - hydrolysis, acid or base catalyzed, of the precursor, inside the solution or suspension, to form M-OH groups according to the reaction



20 wherein X generally is an alcohol residue and n means the element M valence; the alcoxydes M(OR)_n can be replaced by soluble salts of the element M such as chlorides or nitrates, and, in some cases, oxides. The obtained mixture, i.e. a solution or a colloidal suspension, is named sol;

- 25 - polycondensation of the M-OH groups according to the reaction



which requires a time from few seconds to some days, depending on the solution composition and the temperature; during this step, a matrix is formed

called, case by case, alcohogel, hydrogel or more generally, gel;

5 gel drying till the formation of a porous monolithic body; during this step, the solvent is removed through a simple controlled evaporation, which determines the so called xerogel, or through an extraction in autoclave which determines the so called aerogel; the obtained body is a porous glass, which may have an apparent density of 10% to about 50% of the theoric density of the oxide having the same composition; the dried gel can be industrially used as such;

10 - densification of the dried gel by a treatment at a temperature, generally ranging between 800°C and 1500°C, depending on the gel chemical composition and the preceding step process parameters; during this step the porous gel is becoming dense, under a controlled atmosphere, till to obtain a glassy or ceramic compact oxide having the theoric density, with a linear shrinkage equal to about 50%.

20 The final densification let a glassy product be obtained having good general characteristics, and, however, without any such optical homogeneity property to let the material be crossed by the transmitted light wave front without any suffered distortion.

25 The Applicant has found that in the case suitable treatments under controlled atmosphere are carried out during the densification stage, the final glassy product is obtained having no streak and strip, the same being consequently characterized by an almost total homogeneity.

Therefore, the object of the present invention is a silica glass characterized, inter alia, by the following specific properties:

- 5 - light internal transmittance in the wave length between 185nm and 193nm higher than 85%
- light internal transmittance in the wave length between 193nm and 2600nm higher than 99.5%
- light internal transmittance in the wave length between 2600nm and 2730nm higher than 99%
- 10 - light internal transmittance in the wave length between 2730nm and 3200nm higher than 85%
- no streak, material of class 4 or better according to the rule DIN ISO 10110-4
- no strip
- 15 - no signal in the shadography (no shadow or intensity change)

such a silica glass being prepared according to a sol-gel process wherein, in the meanwhile the densification is achieved, a treatment is carried out by means of an
20 atmosphere containing water traces.

Claims

1. Silica glass characterized by the following specific properties:

- 5 - light internal transmittance in the wave length
 between 185nm and 193nm higher than 85%
- light internal transmittance in the wave length
 between 193nm and 2600nm higher than 99.5%
- 10 - light internal transmittance in the wave length
 between 2600nm and 2730nm higher than 99%
- light internal transmittance in the wave length
 between 2730nm and 3200nm higher than 85%
- no streak, material of class 4 or better according to
 the rule DIN ISO 10110-4
- 15 - no strip
- no signal in the shadography (no shadow or intensity
 change)

20 such a silica glass being prepared according to a sol-
 gel process wherein, in the meanwhile the densification
 is achieved, a treatment is carried out by means of an
 atmosphere containing water traces.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C03C1/00

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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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| X | TSENG T Y ET AL: "Various atmosphere effects on sintering of compacts of SiO/sub 2/ microspheres" J. MATER. SCI. (UK), JOURNAL OF MATERIALS SCIENCE, OCT. 1986, UK, vol. 21, no. 10, 1986, pages 3615-3624, XP001189680 ISSN: 0022-2461 the whole document | 1 |
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☒ Patent family members are listed in annex.

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